I felt that the philosophical discussions were actually rather shallow. Dharma-wardana writes as an avowed physical materialist, and he has little to say about the nature of the conscious mind that has not been said before. He cannot find any explanation for the phenomenon of consciousness except that it must be 'emergent', but he believes that the problem will be solved once neuroscience 'becomes of age'. This does not get us very far. His final discursive and somewhat sceptical views on life, the world and everything seemed to me to contain no particularly compelling insights.

A lot of information is presented in this book, and it has an impressive collection of references, but I find it hard to identify a suitable level of readership. Sometimes much space is taken on elementary topics, while in other places specialist knowledge is taken for granted. Overall, I felt that the author's views did not really merit being expressed at this length. The book is something of a self-indulgence on its author's part.

Peter J. Bussey
School of Physics and Astronomy, University of Glasgow, Glasgow, UK
peter.bussey@glasgow.ac.uk

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The Cosmic Century: A History of Astrophysics and Cosmology, by Malcolm S. Longair, Cambridge, Cambridge University Press, 2013, 561 + 16 pp., £30.00 (paperback), ISBN 978-1-10-766936-9. Scope: monograph, reference, review. Level: postgraduate, advanced undergraduate, early career researcher, researcher, teacher.

The twentieth century saw many revolutions in astronomy and cosmology and it is hard to think of anyone better able to introduce and explain them all than Professor Malcolm Longair, prodigious author of many successful textbooks in the physical sciences and a highly talented expositor. The enormity of the task he faced in this compilation is evident. Originally begun as a contribution to a volume entitled *Twentieth Century Physics* (Institute of Physics, 1995), it blossomed into the present 540 pages volume replete with references to over 1000 famous scientific articles, an author index containing just as many names and copious notes at the end of each chapter often giving fascinating insight into how the various scientific discoveries unfolded. As Longair explains, historical material can provide genuine physical insight into our modern view of the universe, yet it is hard to find the relevant material in a readily accessible place. Here, then is a self-contained scientific volume of immense value to researchers of all levels, from the interested undergraduate and graduate student, through professors wishing to enrich their lectures, to historians of science who will find the technical explanations particularly helpful. Longair has aptly arranged the book with this broad audience in mind. Rather than detailing a chronological story, different sections focus on the development of specific fields typically over 50 years. For example, the section entitled 'Stars and Stellar Evolution to 1939' (70 pages) takes us from the beginnings of spectral classification through the impact of atomic and quantum physics on early theories of energy generation in stars to the equations of stellar structure and the nature of red giants and white dwarfs. Explanatory supplements significantly enhance the educational value. Although it is perhaps surprising that the section entitled 'The Large Scale Structure of the Universe to 1939' covering the nature of extragalactic nebulae and their recession velocities, the impact of General Relativity and birth of classical cosmology warrants only 50 pages, much has been written recently elsewhere on this particular story and Longair provides a comprehensive list of secondary literature. Astronomical discoveries since 1945 often followed technological developments and 'Opening up the Electromagnetic Spectrum' (47 pages) highlights the growth of cosmic ray astrophysics, radio, X-ray, gamma-ray and infrared astronomy as well as the impact of modern charge coupled devices in optical astronomy. By highlighting key scientific discoveries along the way, Longair weaves an interesting account, although the treatment is a little hurried given the significance, e.g. of the development of NASA's Hubble Space Telescope and various generations of large ground-based telescope. The largest two sections discuss 'The Astrophysics and Stars and Galaxies since 1945' (140 pages) and 'Astrophysical Cosmology since 1945' (133 pages) and these represent the book's primary value. The pace of discovery has been so rapid, particularly in the 1980s and 1990s, that inevitably fascinating topics such as the study of gamma ray bursts, extrasolar planets and brown dwarfs must be covered in only a few pages each. Nonetheless, the treatment is surprisingly lively and accurate and the explanatory supplements provide valuable pedagogical explanations. As is fitting for an author who contributed significantly to the topic, the final section on cosmology is particularly well written with fascinating quotes from early colleagues such as Fred Hoyle and William McCrea. This section spans early attempts to measure the cosmic deceleration parameter using the Palomar 200-inch telescope through the surprising discovery of the accelerating universe, and the developing story of structure in the cosmic microwave background and the cold dark matter model. Although progress continues apace in all of the above areas, Longair's achievement is remarkable not only in scope but also in scientific depth and insight. The only omission, perhaps,

is an epilogue from the author on lessons learned from a remarkable century of discovery and surprises, and his personal vision for what might be achieved by the end of the present century.

Richard Ellis
Caltech, Pasadena, CA, USA
rse@astro.caltech.edu

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Polarons, by David Emin, Cambridge, Cambridge University Press, 2012, 227 + 18 pp., £70.00 (hardback), ISBN 978-0-52-151906-9. Scope: monograph. Level: postgraduate, researcher.

In their seminal undergraduate textbook, Ashcroft and Mermin devote a single paragraph (plus one amusing footnote) to polarons. Kittel devotes three pages to these entities, although one of these is entirely taken up by a rather large figure. One might therefore be forgiven for ignoring the subject. However, the polaron concept, of a quasiparticle formed from an electron plus the surrounding strain field, seems to be a simple and important one that fits well within the modern conception of condensed matter physics, where broken symmetry allows one to picture a solid as a toy universe with excitations (such as polarons) forming the fundamental particles of that universe. It is therefore gratifying to see the appearance of David Emin's new book 'Polarons', whose cover is adorned by a figure similar to that taking up one of Kittel's three pages. (Readers of recent physics textbooks will have noticed that there seems to be a rule that all serious books depict coloured circles on their covers.) Cover aside, the worthwhile aim of this new volume is to describe the many types of polaron, along with their properties and a perspective on the role of these quasiparticles in some current problems.

The author's intention in writing the book is to eschew mathematical formalism and to stress fundamental physics. In part I, there are clear descriptions of several conceptions of the polaron, including the molecular version and the idea of bipolarons. Part II concentrates on the physical properties of the particles, while Part III extends the concepts introduced in the earlier parts of the work to four areas, including superconductivity and hopping of light atoms, where the author suggests a polaron description is important. Here, the book works rather well, collecting these topics together and providing a coherent description. This will be of value to those who have found it difficult to know where to begin looking into topics such as the magnetic polaron, when they have featured in the recent research literature.

Where the book is slightly lacking is in providing some simple mathematical motivation for the physics presented. In his introduction, the author states his choice not to describe 'oversimplified models'. However, this could be a mistake: some simple physics at the level of Feynman's description of the polaron problem in his 'Statistical Physics' would cue up the more advanced topics and provide a leg-up for the uninitiated. The result of not including such material is that the book has more of the feel of a review, presenting key equations and results with plentiful explanation, but without bridging the gap from the three-page textbook treatment.

Ultimately, Emin's book is a useful addition to the literature and will be of benefit to many workers puzzled by the relative silence on this topic. The style is straightforward and informative and the figures are clear (if a little small). By the author's admission, the choice of topics is idiosyncratic, but will be of interest to those left puzzled by the regular invocation of the polaron in many branches of current condensed matter research.

Tom Lancaster
Department of Physics, Durham University
Durham, UK
tom.lancaster@durham.ac.uk

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Physical Mathematics, by Kevin Cahill, Cambridge, Cambridge University Press, 2013, 681 + 18 pp., £50.00 (hardback), ISBN 978-1-10-700521-1. Scope: reference, text book. Level: advanced undergraduate, researcher.

This book represents a comprehensive collection of mathematical tools as needed and commonly applied in physical sciences. While covering a broad range, individual sections generally start with a concise and direct presentation of a certain mathematical topic and then give an example of its application, mostly to a physics problem. The presentation is concise in the sense that no lengthy derivations are given, but definitions and their consequences as well as connections between the topics and some historic background are provided. There are comparable books on the market which treat the borderline between mathematics and physics, sometimes as physical mathematics, sometimes as mathematical physics, depending on the point of view, and normally this does not matter in the end, as long as the material is well selected and well presented. This book is indeed very modern with regard to notation, language, style of presentation, but most importantly in the selection of topics. It treats linear algebra, Fourier series, Fourier and Laplace transforms, infinite series, complex variable theory, differential equations, integral equations,